

# PATENT SPECIFICATION

(11)

1 603 047

1 603 047

- (21) Application No. 17250/78 (22) Filed 2 May 1978  
 (31) Convention Application No. 812688 (32) Filed 5 Jul. 1977 in  
 (33) United States of America (US)  
 (44) Complete Specification Published 18 Nov. 1981  
 (51) INT. CL.<sup>3</sup> C11D 7/24  
 (C11D 7/24 1/02 1/38 1/66 1/88 3/14  
 7/26 7/30)  
 (52) Index at Acceptance  
 C5D 6A10 6B11B 6B11C 6B12N1 6B12N2  
 6C5 6C8 7B11B 7B11C 7C8 7E1E  
 7E3B



## (54) CLEANERS CONTAINING D-LIMONENE

(71) I, VINCENT DOTOLLO, a citizen of the United States of America, 1989 Bellair Road, Clearwater, Florida 33516, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:-

### BACKGROUND OF THE INVENTION

This invention relates to cleaning compositions containing D-limonene which are useful as cleaners for hands, carpets, glass and other hard surfaces, office equipment, etc.

D-limonene is a water white to slightly yellow mono-cyclic terpene usually obtained as a by-product from the manufacture of citrus molasses. It is obtained by steam distillation of citrus peels and pulp resulting from the production of citrus juices and is referred to a stripper oil, which contains about 94-98% of the D-limonene.

### BRIEF DESCRIPTION OF THE INVENTION

It is an object of this invention to provide cleaning compositions comprising D-limonene. It is another object of this invention to provide a hand cleaning composition comprising D-limonene in the gel or liquid state.

It is a further object of this invention to provide a cleaning composition comprising D-limonene as a concentrate to be diluted with water in use.

An additional object of this invention is to provide a cleaning composition containing D-limonene which is suitable for use on glass and hard surfaces.

Another object of this invention is to provide a cleaning composition containing D-limonene suitable for use as on office equipment.

Still a further object of this invention is to provide a cleaning composition containing D-limonene and an abrasive suitable for use as an oven cleaner or metal cleaner.

### DETAILED DESCRIPTION OF THE INVENTION

The invention is particularly concerned with the provision of a wide variety of cleaning compositions, generally all purpose, containing as their principal ingredient D-Limonene in an amount not less than 10% by volume. Depending upon the type of cleaning action desired from the cleaning compositions, the D-limonene is used as a cleaning solvent along with surfactants, emulsifiers, other solvents, abrasives and water.

Any suitable surface-active agents, i.e. emulsifiers and surfactants, can be used in the cleaning compositions which serve to emulsify with the D-limonene. A surfactant particularly suitable is octylphenyl polyethoxy ethanol, which surfactant is commercially available from the Rohm and Haas Company under the tradename, "TRITON X-100". This surfactant is stated to contain 10 moles of ethylene oxide per molecule and to have a viscosity of 250 centipoises at 77 F. (Brookfield) and a specific gravity of about 1.065 at 77 F. A suitable emulsifier which can be used is commercially available from the Stepan Company under the trade name of "emulsifier WHC" and is a mixture comprising 20-40% mixed soap, 10-20% polyhydric alcohol, and 5-15% mixed fatty acids. Another suitable surfactant which can be used herein are surfactants commercially available from the GAF Corporation under the tradename of IGEPAL CO-630 which is a nonylphenoxypoly-(ethyleneoxy)ethanol with 65% ethylene oxide and a molar ratio of 9 (i.e. the number of moles of ethylene oxide per mole of nonylphenol).

Although the above specific surfactants and emulsifiers have been set forth, it is understood that any suitable surfactant or emulsifier can be used, can be of the non-ionic, anionic, cationic or amphoteric type, and of natural or synthetic origin, with the only requirement being that it is liquid as used herein and serves to emulsify with the

D-limonene and any other components of the composition which require to be emulsified.

Another component suitable for use with the cleaning compositions, when used as cleaners for glass, hard surfaces, and office equipment, are water, miscible solvents along with the D-limonene. A suitable solvent which can be used is sold by the Du Pont Company under the trademark "FREON" TE solvent which is an azeotrope of ethyl alcohol in a saturated fluorocarbon solvent. Another suitable solvent is a chlorinated type solvent e.g. 1,1,1-trichloroethylene. Still other solvents can be used with the only requirement being that it be liquid, and that it be compatible with the other ingredients of the cleaning compositions.

An additional component of the cleaning compositions when used as e.g. oven or metal cleaners, is an abrasive. Suitable abrasives are diatomaceous earth, pumic. Other various well-known abrasives can also be used depending on the particular metal surface to be cleaned.

The various components of the cleaning compositions are to be used in various proportions depending on the use to be made of the specific cleaning composition. When used as a gel hand cleaner or lotion, the composition comprises 10-50% D-limonene, 3-18% surfactant or emulsifier and the remainder water by volume, preferably 35-37.5% D-limonene, 13.5-15.5% surfactant or emulsifier, and the remainder water. When used as a carpet cleaner concentrate, the composition comprises about 50% D-limonene, 4-11% surfactant, preferably 8%, and the remainder water. When used as a glass or hard surface cleaner including a solvent, the composition comprises 10-50% D-limonene, 1-15% surfactant, 1-40% solvent and the remainder water by volume, preferably 42-45% D-limonene, 1-3% solvent, 3-11% surfactant and the remainder water. When used as an office equipment cleaner, the composition comprises 85-98% D-limonene and 2-15% solvent by volume. When used as an oven or metal cleaner including an abrasive, the composition comprises the hand cleaner of 10-50% D-limonene, 3-18% surfactant, and the remainder water. Generally, about 100 parts of the hand cleaner to 2-40 parts of abrasive, by volume is suitable, preferably 6-30 parts of the abrasive to about 100 parts of the hand cleaner.

The composition may be prepared in any suitable manner. Specifically, for the gel type hand cleaner, the composition is prepared by mixing and blending the D-limonene with water, and the subsequent addition of the surfactant with additional mixing until a gel is formed. When preparing the hand lotion, or carpet cleaner, the same procedure is followed but no gel is formed because the amount of surfactant added is insufficient to form a gel. In the preparation of the composition as a hard surface cleaner where an additional solvent is added, the same procedure is followed and the solvent is added after the mixing and blending of the components. Where an abrasive is included in the composition to be used as an oven or metal cleaner, the abrasive is added to the D-limonene and water prior to the addition of the surfactant.

The following Examples are set forth to further illustrate the present invention but are not intended to be limiting in any sense. The proportions of components are set forth in volume percentages.

#### EXAMPLE 1 — HAND CLEANER GEL

Emulsifier WHC 15%

(Stepan Chemical Co.

Northfield, Illinois)

D-limonene 35%

Water remainder

#### EXAMPLE 2 — HAND CLEANER GEL

Emulsifier DOW 555 (Dow Chemical Co.) 14%

D-limonene 36%

Water remainder

#### EXAMPLE 3 — HAND CLEANER GEL

Emulsifier Triton X-100 15%

(Ashland Chemical Co., Columbus Ohio)

D-Limonene 37.5%

Water remainder.

When using the gel cleaners of the above Examples to clean dirty hands, hard to remove

hand soilers are easily removed, leave the hands soft, and leave a pleasant citrus scent. The gel does not normally need water for removal from the hands, and can be wiped off with a towel.

**EXAMPLE 4 — HAND LOTION CLEANER**

5	Emulsifier WHC (Stepan Chemical Co.)	13%	5
	D-limonene	35%	
	Water	remainder	

**EXAMPLE 5 — HAND LOTION CLEANER**

10	Emulsifier DOW 555 (Dow Chem. Co.)	10%	10
	D-limonene	36%	
	Water	remainder	

**EXAMPLE 6 — HAND LOTION CLEANER**

15	Emulsifier TRITON X-100	11%	15
	D-limonene	35%	
	Water	remainder	

The hand lotion cleaner is a milder cleaner for the hands than the gel cleaner and can be used with or without water for rinsing.

**EXAMPLE 7 — CARPET CLEANER CONCENTRATE**

20	Emulsifier WHC	8%	20
	D-limonene	50%	
	Water	42%	

**EXAMPLE 8 — CARPET CLEANER CONCENTRATE**

25	Emulsifier DOW 555	8%	25
	D-limonene	50%	
	Water	42%	

**EXAMPLE 9 — CARPET CLEANER CONCENTRATE**

30	Emulsifier TRITON X-100	8%	30
	D-limonene	50%	
	Water	remainder	

**EXAMPLE 9A — CARPET CLEANER CONCENTRATE**

35	Stepan WHC	6%	35
	Igepal CO-630	2%	
	D-limonene	50%	
40	Water	remainder	40

**EXAMPLE 9B — CARPET CLEANER CONCENTRATE**

45	TRITON X-100	5%	45
	Igepal CO-630	3%	
	D-limonene	50%	
	Water	remainder	

**EXAMPLE 9C — CARPET CLEANER CONCENTRATE**

50	Stepan WHC	3%	50
	Igepal CO-630	5%	
	D-limonene	50%	
	Water	remainder	

The concentrate is diluted by adding 1 part thereof to 25-50 parts of water, depending upon the cleaning equipment used. The concentrate itself is a good spot remover in carpets. The concentrate is also a good upholstery cleaner.

**EXAMPLE 10 — GLASS AND HARD SURFACE CLEANER**

60	Emulsifier WHC	6%	60
	FREON TE (Du Pont Chemicals)	2%	
	D-limonene	43%	
	Water	remainder	

**EXAMPLE 11 — GLASS AND HARD SURFACE CLEANER**

	Emulsifier DOW 555	5%	
	FREON TE	2%	
	D-limonene	43%	
5	Water	remainder	5

**EXAMPLE 12 — GLASS AND HARD SURFACE CLEANER**

	Emulsifier TRITON X-100	4%	
	FREON TE	3%	
10	D-limonene	44%	10
	Water	remainder	

**EXAMPLE 13 — GLASS AND HARD SURFACE CLEANER**

	Emulsifier Igepol CO-630	5%	
15	TRITON X-100	2%	15
	FREON TE	2%	
	D-limonene	43%	
	Water	remainder	

**EXAMPLE 14 — GLASS AND HARD SURFACE CLEANER**

20	Trichlorethylene	4%	20
	Emulsifier Igepol CO-630	5%	
	TRITON X-100	2%	
	D-limonene	43%	
25	Water	remainder	25

2-6 parts concentrate per 100 parts of water makes an effective glass cleaner and 2-25 parts per 100 parts of water makes a good hard surface cleaner (tile, formica, porcelain, etc.).

**EXAMPLE 15 — OFFICE EQUIPMENT CLEANER**

30	Solvent FREON TE	2%	30
	D-limonene	98%	

**EXAMPLE 16 — OFFICE EQUIPMENT CLEANER**

35	Chlorinated solvent (Trichlorethylene)	3%	35
	D-limonene	97%	

**EXAMPLE 17 — OFFICE EQUIPMENT CLEANER**

	Chlorinated solvent 1, 1, 1, (Trichlorethylene — DOW Chemicals)	1%	
40	D-limonene	99%	40

**EXAMPLE 18 — OFFICE EQUIPMENT CLEANER**

45	FREON TE	15%	45
	D-limonene	85%	

The above office equipment cleaner leaves a film residue which protects and lubricates the surface. The use of less D-limonene and more of the solvent, results in less film being left. The greater the amount of D-limonene and less of solvent, the greater the amount of film left. The film acts as lubricant on the surface. The solvent can be increased from 3% to 25% to provide less lubricating film residue in office equipment cleaners.

The following Examples set forth the use of the cleaning compositions of the invention as oven and metal cleaners containing abrasives. The basic composition is the above set forth gel and lotion hand cleaners with the addition of an abrasive. Generally, 3-40 parts of abrasive is added to 100 parts of the basic hand cleaner composition by volume. In the following Examples the following basic composition is used:

**EXAMPLE 19 — (BASIC COMPOSITION)**

55	Emulsifier WHC	15%	55
	D-limonene	35%	
	Water	remainder	

**EXAMPLE 20 — OVEN CLEANER**

100 parts — Example 19  
25 parts — diatomaceous earth

**EXAMPLE 21 — SILVER METAL CLEANER**

100 parts — Example 19

3 parts — diatomaceous earth

**EXAMPLE 22 — BRASS METAL CLEANER**

100 parts — Example 19

30 parts — diatomaceous earth

**EXAMPLE 23 — ALUMINUM METAL CLEANER**

100 parts — Example 19

20 parts — diatomaceous earth

**EXAMPLE 24 — STAINLESS STEEL CLEANER**

100 parts — Example 19

15 parts — diatomaceous earth

The following Examples set forth hand cleaners which can be cleaned off after use by merely rinsing with water. The basic gel or lotion hand cleaners discussed above combine two surfactants. Generally the composition containing two surfactants comprises 10-50% D-limonene, 3-18% of the mixed surfactants and the remainder water. The mixed surfactants can comprise as one surfactant 1-5% Igepal CO-630 and as a second surfactant 2-13% of either Emulsifier WHC or TRITON X-100. This type of composition can be made into a gel or lotion, and also as a carpet cleaner and as a cleaner containing an abrasive

**EXAMPLE 25**

D-limonene

35%

2% Igepal CO-630

10% Emulsifier WHC

Water

15%

remainder

**EXAMPLE 26**

D-limonene

36%

3% Igepal CO-630

7% TRITON X-100

Water

13%

remainder.

The above cleaning compositions containing D-limonene are bio-degradable, non-pollutant, and non-irritating to the skin. When used as a carpet cleaner it is bactericidal and fungicidal but not harmful to persons handling the composition.

The D-limonene used in the compositions herein should preferably contain a suitable commercially available stabiliser to retain its original state and prevent it from becoming rancid.

**WHAT I CLAIM IS:-**

1. A cleaning composition comprising 10-50% D-limonene, 3-18% surfactant and the remainder water, by volume.

2. The cleaning composition of claim 1, wherein said D-limonene comprises 35-37.5%, and said surfactant comprises 13.5-15.5%.

3. The cleaning composition of claim 1, wherein said surfactant comprises a mixture of two surface active agents.

4. A cleaner concentrate comprising 50% D-limonene, 4-11% surfactant and the remainder water, by volume.

5. The cleaner concentrate of claim 4, wherein said surfactant comprises about 8%.

6. A cleaning composition comprising 10-50% D-limonene, 1-15% surfactant, 1-40% solvent and the remainder water, by volume.

7. The cleaning composition of claim 6, wherein said D-limonene comprises 42-45%, said solvent comprises 1-3%, and said surfactant comprises 3-11%.

8. A cleaning composition comprising 85-98% D-limonene and 2-15% solvent, by volume.

9. A cleaning composition comprising:

A. 10-50% D-limonene, 3-18% surfactant, and the remainder water, by volume, and  
B. an abrasive,

wherein said abrasive is present in a volume amount of 2-40 parts per 100 parts of A.

10. The cleaning composition of claim 9, wherein said abrasive comprises 6-30 parts per 100 parts of A.

11. A cleaning composition substantially as herein described with reference to the Examples.

R.G.C. JENKINS & CO.  
Chartered Patent Agents,  
Chancery House,  
53-64 Chancery Lane,  
London WC2A 1QU  
Agents for the Applicants

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1981.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.

**THIS PAGE BLANK (USPTO)**